MATHEMATICS

Chapter 7: Coordinate Geometry

Coordinate Geometry

1. **Coordinate axes:**

   Two perpendicular number lines intersecting at point zero are called **coordinate axes**. The point of intersection is called **origin** and denoted by '*O*'. The horizontal number line is the **x-axis** (denoted by *X'OX*) and the vertical one is the **y-axis** (denoted by *Y'OY*).

2. **Cartesian plane** is a plane formed by the coordinate axes perpendicular to each other in the plane. It is also called as *xy* plane.

   The axes divide the Cartesian plane into four parts called the **quadrants** (one fourth part), numbered I, II, III and IV anticlockwise from *OX*.

   Points on a Cartesian Plane

   A pair of numbers locate points on a plane called the coordinates. The distance of a point from the y-axis is known as abscissa or x-coordinate. The distance of a point from the x-axis is called ordinates or y-coordinate.
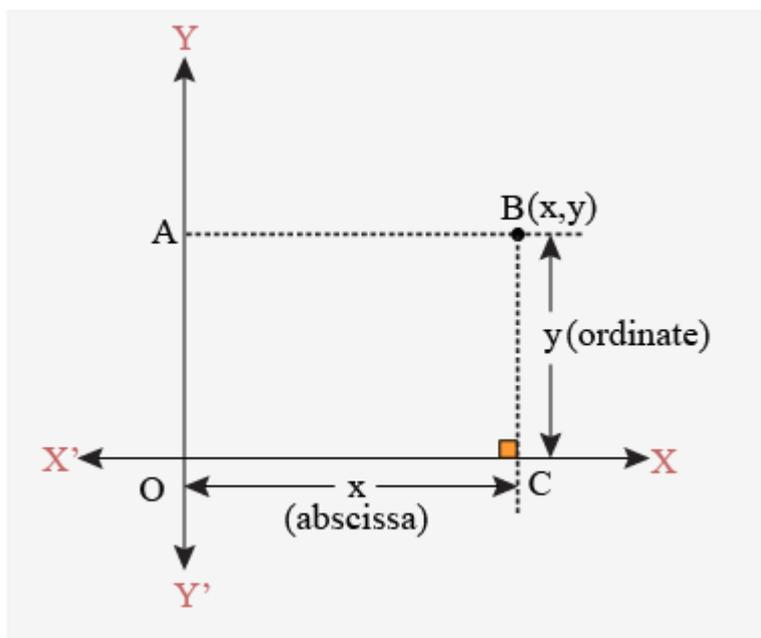
Representation of (x,y) on the cartesian plane

3. **Coordinates of a point:**
   - The x-coordinate of a point is its perpendicular distance from *y*-axis, called **abscissa.**
   - The y-coordinate of a point is its perpendicular distance from *x*-axis, called **ordinate**
   - If the abscissa of a point is *x* and the ordinate of the point is *y*, then (*x, y*) is called the **coordinates** of the point.
   - The point where the *x*-axis and the *y*-axis intersect is represented by the coordinate point (0, 0) and is called the **origin**.

4. **Sign of the coordinates in the quadrants:**

   Sign of coordinates depicts the quadrant in which it lies.
   - The point having both the coordinates positive i.e. of the form (+, +) will lie in the first quadrant.

- The point having x-coordinate negative and y-coordinate positive i.e. of the form (-, +) will lie in the second quadrant.
- The point having both the coordinates negative i.e. of the form (-, -) will lie in the third quadrant.
- The point having x-coordinate positive and y-coordinate negative i.e. of the form (+,-) will lie in the fourth quadrant.
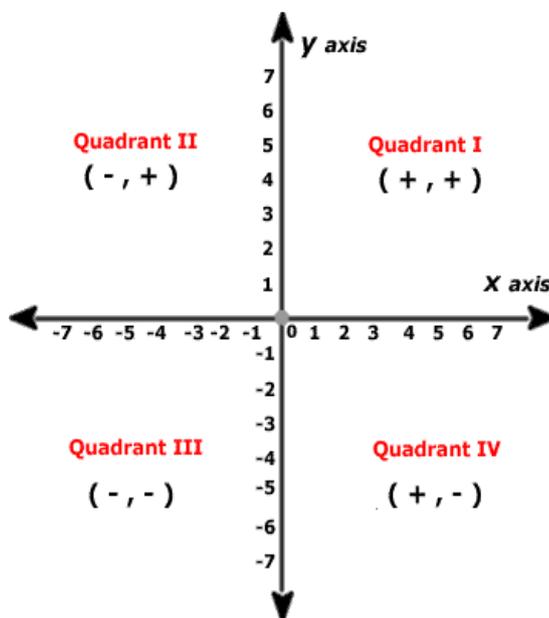
5. Coordinates of a point on the x-axis or y-axis:

The coordinates of a point lying on the *x*-axis are of the form (*x*, 0) and that of the point on the *y*-axis are of the form (0, *y*).

6. Distance formula

The distance formula is used to find the distance between two any points say *P(x₁, y₁)* and *Q(x₂, y₂)* which is given by: $PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

- The distance of a point P(x, y) from the origin O(0, 0) is $OP\sqrt{x^2 + y^2}$
- The points *A, B* and *C* are **collinear** if *AB + BC = AC*.

Distance between Two Points on the Same Coordinate Axes

The distance between two points that are on the same axis (x-axis or y-axis), is given by the difference between their ordinates if they are on the y-axis, else by the difference between their abscissa if they are on the x-axis.
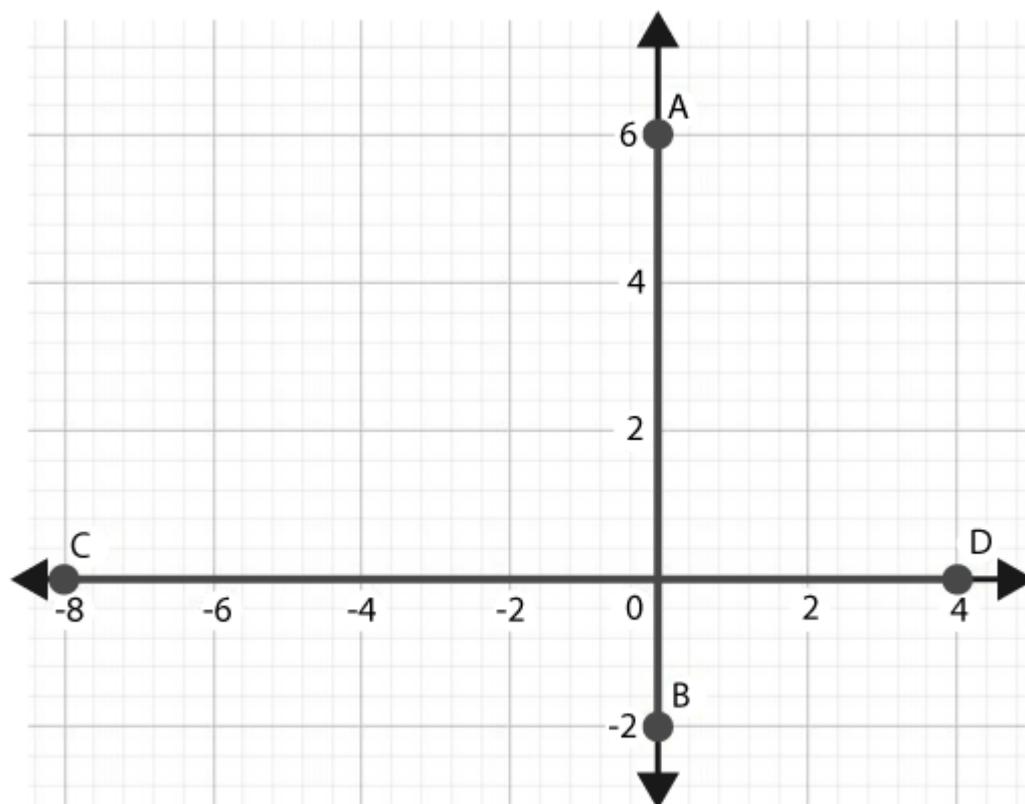
Distance AB = 6 – (-2) = 8 units

Distance CD = 4 – (-8) = 12 units

Distance between Two Points Using Pythagoras Theorem